

REMARKS

I. 35 U.S.C. §103(a) rejections - Liu, Miseki & Gupta

The pending claims are directed to technology that generates a low-noise output signal starting with a noisy acoustic input signal. The technology transforms a digitized acoustic input signal to a time-frequency representation. For each interval of the time-frequency representation containing significant signal levels, the technology performs a signal-to-noise ratio weighted comparison of the time-frequency representation against multiple time-frequency spectrogram templates in a signal model. Spectrogram templates are signal representations in time, frequency, and magnitude that provide frequency component magnitude information over time and over frequency. Note that a matching spectrogram template in the signal model provides a low-noise estimation of the signal content in the time-frequency representation. Consequently, the input signal may be replaced with a low-noise output signal formed as a signal-to-noise ratio weighted mix of the time-frequency representation and the matching spectrogram template. The weighting ensures that signal bands that carry significant noise are primarily replaced with content from the matching (lower-noise) spectrogram. This process is described in the Specification at page 12, for example.

Assuming for argument's sake that there is motivation to combine the cited references, the combined disclosure of Liu, Miseki, and Gupta would describe a speech codec. The codec resulting from the combined disclosure would enhance LPC/CELP speech coding in the presence of background noise by relying on a codebook to encode noise (Liu, Col. 10, lines 16-24) or by directly encoding of noise signal (Miseki, Col. 12, lines 30-48), while determining active voice duration (Gupta, Col. 2, line 40 - Col. 3, line 43). Nevertheless, the combined disclosure differs from the claimed technology in several ways.

As one example, the combined disclosure does not include signal-to-noise ratio weighted comparison spectrogram matching. Instead, a codebook provides a series

codes for matching to a speech feature vector. The code that yields minimum distortion is chosen from the codebook and the code index is transmitted over the channel to a receiver. (Liu, Col. 10, lines 16-24). Each code is a set of autocorrelation coefficients, not a spectrogram template. (Liu, Col. 10, lines 53-62). The alternate approach, direct noise signal encoding, does not even employ a code book, let alone weighted spectrogram matching. In that approach, the combined disclosure directly converts noise content to a transform coefficient representation (e.g., through an FFT) subsequently divided into sub-bands that are individually encoded. (Miseki, Col. 12, lines 30-48).

As another example, the combined disclosure does not disclose replacing an input signal with a low-noise output signal that is a signal-to-noise ratio weighted mix of the time-frequency representation of the input signal and the matching spectrogram template. The Office Action recognizes that Liu does not teach such a replacement technique and instead asserts that Miseki discloses the relevant limitation. However, as explained above, the combined disclosure generates a noise signal component directly from the input signal, whether with the aid of a codebook, or direct conversion. Thus, there is no teaching or suggestion in the combined disclosure to form a low-noise output signal as a weighted mix of a time-frequency representation of an input signal and what has been determined to be a matching spectrogram template.

Furthermore, the Applicant respectfully submits that the reliance on Gupta in the combined disclosure as determining noise duration is misplaced. In fact, a combined disclosure following Gupta would teach the opposite, namely determining voice or signal duration. In the context of an echo canceller, in order to prevent completely dead time that sounds like a line disconnection, Gupta inserts noise into a channel when there is no voice activity. To that end, Gupta monitors voice activity, not noise duration. When voice activity has subsided at the near-end and far-end of a connection for the respective "hangover" durations, Gupta begins to store noise samples for re-insertion into the channel to prevent dead time. (Gupta, Col. 2, line 40 - Col. 3, line 23).

II. 35 U.S.C. §103(a) rejections - Liu, Miseki, Gupta & Fink

The expanded combined disclosure, including Fink, does not make up for the deficiencies noted above in original combined disclosure. With Fink, the combined disclosure would also include reducing uncomfortable transients. In other words, in addition to speech codec functions, the expanded combined disclosure would split a signal into a quasistationary part that includes voice formant frequencies and a residual signal that potentially includes transients. (Fink, Col, 2, lines 21-30). In order to reduce unpleasant transients, the expanded combined disclosure would employ a multiplier to reduce amplification of the transient and employ a pitch manipulator to shift its frequency. (Fink, Col. 6, lines 38-48).

Notably absent from the expanded combined disclosure, however, is any teaching or suggestion to match an input spectrogram against multiple spectrogram templates, let alone that the comparison may be done in a signal-to-noise ratio weighted manner. As another example, the expanded combined disclosure is still silent with regard to generating a low noise output signal by employing a signal-to-noise ratio weighted mix of an input spectrogram and a matching spectrogram. Instead, the expanded combined disclosure reduces transient magnitudes using a multiplier on a residual signal originally obtained from the input signal.

Accordingly, the Applicant respectfully submits that, even assuming a motivation to combine the references for argument's sake, neither the original combined disclosure nor the expanded combined disclosure teaches or suggests the claimed technology.

III. New Claims 10-23

Claims 10-23 are new dependent claims. The new claims set forth that the low-noise output signal is a low-noise spectrogram, and that the signal-to-noise ratio weighted mix is determined consistent with a particular equation. In addition, the new claims recite that, in addition to the low-noise output signal, an output time series is synthesized. In particular, the output time series is formed from a harmonic part and a

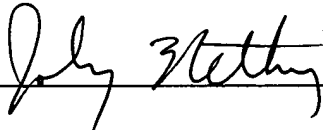
non-harmonic part derived from the low-noise spectrogram. The Specification sets forth these features at pages 12-13, for example.

The dependent claims are believed allowable over the art cited in the Office Action.

IV. Conclusion

Because the combined disclosures fail to teach or suggest the claimed subject matter, the Applicant respectfully submits that the pending Claims are allowable. The Examiner is invited to contact the undersigned attorneys for the Applicant via telephone if the Examiner has any questions, comments, or concerns, or if a telephone conference would expedite examination of this application.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "John Nethery", is written over a horizontal line.

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